Evaluation of hirsutism treatment by Nd.Yag laser and diode laser in different hormonal profiles.

Thesis
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ABSTRACT

The excessive or unwanted hair is often a strong enough reason that motivates patients, especially women to seek medical advice. The terms hirsutism and hypertrichosis are often applied indiscriminately to excessive hair growth. Hirsutism will be restricted to the growth of coarse terminal hair in the male adult sexual pattern in the female. Traditional available methods for treating hirsutism include; shaving, waxing, depilatory creams and camouflaging as bleaching. These methods are temporary and they may cause significant side effects. Although electrolysis and thermolysis are considered a long term hair removal procedures they are known to be extremely time consuming and very painful.

Recently laser technology has proven itself as a leader in hair removal among the above mentioned modalities being monochromatic, coherent and collimated providing a .very useful type of light energy which would be used very effectively in treating hirsutism. The goal of laser hair removal is to achieve follicular destruction than temporary epilation resulting from heating of hair shaft alone.

Key words: Hirsutism – laser – Electrolysis

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The excessive or unwanted hair is often a strong enough reason that motivates patients, especially women to seek medical advice. There are three main causes of unwanted hair growth stimulating the need to remove it. These are pathological, in some reconstructive surgeries and psychological ***(Grossman , 1999)*.**

The pathological causes are mainly due to hypertrichosis and hirsutism. The terms hirsutism and hypertrichosis are often applied indiscriminately and interchangeably to excessive hair growth of any type in any distribution. On phylogenic grounds and on the basis of its specific androgenic induction, the growth in the female of coarse terminal hair in the male adult sexual pattern should he differentiated clearly from the numerous other forms of excessive hair growth. The term hirsutism will be restricted to androgen dependent hair pattern. ***(Dawber et al, 1998).***

Hirsutism may he idiopathic in nature; or hormonal dependent secondary to stein-leventhal (polycystic ovary) syndrome, adrenal abnormalities, hyperprolactinemia, and acromegaly; due to the use of medications as oral contraceptives and in some causes of menopause ***(Grossman, 1999).***

Relationship of hirsutism to various hormonal levels is of special importance. There have been several attempts to correlate hair growth in women with plasma androgen levels; total and free

testosterone as well as dehydroepiandrostenedione sulfate are among the main androgens that are suggested to affect hair pattern in females ***(Reingold and Rosenfeild, 1987)*.**

The exact relationship between prolactin and hirsutism is not clear. The incidence of hirsutes in the amenorrhea-galactorrhea syndrome had been reported as 22 to 60 percent ***(Robyn and 'Tukumbane, 1983).***

Traditional available methods for treating hirsutism include; shaving, waxing, depilatory creams and camouflaging as bleaching. These methods are temporary and they may cause significant side effects. They proved to be unsatislactory to most patients. Although electrolysis and thermolysis are considered a long term hair removal procedures they are known to be extremely time consuming and very painful, furthermore side effects are very common ***(Surnian et al., 1999).***

Recently laser technology has proven itself as a leader in hair removal among the above mentioned modalities being monochromatic, coherent and collimated providing a .very useful type of light energy which would be used very effectively in treating various types of dermatological disorders including hirsutism ***(Dierickx, 2000).***

Hair removal by laser primarily depends on selective photothermolysis which refers to selective thermal destruction of a pigmented structure with laser taking three requirements into consideration; first a fluence exceeding the thermal threshold, second wavelength absorbed by the target, third the pulse duration shorter than

or equal to the time it takes to diffuse from the target into the surrounding tissues ***(Anderson and Parrish, 1987).***

Thermokinetic selectivity is an extension to the selective photothermolysis. According to the proposed theory, target chromophore of large volume is not capable of transmitting the absorbed laser energy to surrounding areas while small volume of the same chromophore is more capable of transmitting this energy. Therefore with careful selection of the pulse duration and energy the large targets are destroyed while the smaller targets of the same chromophore are merely warmed thus affection of the hair melanin while sparing the skin melanin could be achieved ***(Boss et al, 1999)*.**

Several lasers were tried in the field of laser hair removal: the blue green argon laser ***(Bartley et al, 1987)*,** the C02 laser ***(Kuriloff et al, 1988)*** and the Q-suitched ruby laser ***(Grossman, 1999)*.**

Recently diode laser and Nd-yag laser have been extensively used in treatment of hirsutism ***(Dierickx, 2000)****.*

Objective:

The aim of this study is to compare the efficacy of Nd-yag laser and diode laser in treatment of hirsutism. The laser therapy outcome will be correlated to the hormonal levels of the patients.

Patients and methods

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- The study will include 50 hirsute patients.
- Each patient will receive Nd-Yag laser therapy to the right side of the face.
- Each patient will receive diode laser therapy to the left side of the face.
- Hair removal from the axillaries of 10 patients will be done to perform punch skin biopsy before and after therapy
- For each patient the hair count and the hair thickness will be evaluated before and after therapy.
- For each patient total testosterone, free testosterone, dehydroepiandrostenedione sulfate and prolactin will be measured.
- The hormonal levels will be correlated with therapeutic outcome.

REVIEW OF LITERATURE

CHAPTER ONE

Hair Anatomy

A- The hair

Macroscopically, the hair consists of three parts: **the shaft**, projecting from the surface of the skin, **the root**, implanted in the skin inside the hair follicle and **the hair bulb**, the expanded lower end of the hair which is invaginated from below by a connective tissue mass called dermal papilla. The hair shaft is composed of hard keratin, unlike the keratin of the skin which is soft keratin ***(Schlake, 2007).***

Under electron microscope, human hair shafts consist of:

1. **The Medulla** consists of a central core of irregular, shrunken, cornified polyhedral cells free from pigment ***(Grossman, 1999).***

2. **The Cortex** is formed of elongated cornified keratinized imbricated cells containing the pigment, melanin granules, which give the color of the hair. When cut in cross, hair shaftscontain cortex which consist of closely packed spindle-shaped cells ***(Baden, 1990).***

3. **The cuticle** is a layer of flat cells containing hard keratin surrounding the cortex. The cuticle consists of five to 10 overlapping cell layers each 350-450 nm thick.

The enviromental outer surface of each cuticular cell has a very clear layer which is rich in high sulphur protein; this protects the cuticular cells from premature breakdown due to chemical and physical insults. The inner, less dense part of the exocuticle also has a high concentration of sulphur protein ***(Bernard, 2005).***

4. **The Matrix** is formed of a cellular mass occupying the hair bulb and the bottom of the root sheath. It is a mass of undifferentiated epithelial cells. The cells of the matrix receive nourishment from the underlying vascular connective tissue of the hair papilla. Proliferation of these cells results in the growth of the hair in length ***(Grossman, 1999).***

The anagen hair follicle can be divided longitudinally into four segments. The ***infundibular region,*** the most superior segment, is continuous with the surrounding epidermis and terminates at the insertion of sebaceous duct. The ***sebaceous gland*** area is the next deepest. The sebaceous duct is found on the posterior side of the follicle, that is, the side forming an obtuse angle with the epidermis. ***The isthmus*** initiates at the insertion of the sebaceous duct and ends at the insertion of erector pili muscle. The ***bulbar region,*** the inferior segment, contains the dermal papilla, the surrounding matrix cells, and the lowest portion of the follicle ***(Maderson, 2004).***

B. The hair follicle:

The hair follicle is a tube of epidermis sunken into the dermis. The hair follicle consists of two coats, a dermal or outer coat and an epidermal or inner coat ***(Schlake, 2007).*** **The dermal coat** is continuous with the corium and is composed of fibrous tissue. It is highly vascular and has numerous minute nerve filaments. **The epidermis** extends inside the hair follicle as far as the opening of the sebaceous gland and directly adjoins the shaft of the hair. Toward the base of the follicle it forms the external root sheath of the hair. This is separated from the root of the hair by the internal root sheath, which grows upward with the hair

from the base of the follicle to its neck, where it terminates with a free edge. The internal and the external root sheaths blend at the surface of the papilla into the matrix of the hair ***(Maderson, 2004).***

Inner root sheath is composed of: the cuticle, the Huxley (two cell layers thick) and the Henle layers (outermost with one cell layer) ***(Ito, 1986).***

Outer root sheath surrounds the inner root sheath and contains epithelial cells. It consists of two layers (the vitreous and the fibrous layers) ***(Ito, 1986).***

C. Melanin pigment:

The two types of hair melanin are ***eumelanin*** and ***pheomelanin.*** Both pigments are formed from the precursor tyrosine through the enzyme tyrosinase. ***Eumelanin*** produces brown, black hair, whereas ***pheumelanin*** leads to red and blond hair. Hair color is determined by the amount and distribution of melanin ***(Gault et al., 1999).***

In the hair shaft, the melanocytes in the matrix have become unable to form tyrosinase and hence can no longer form melanin. The whole range of hair color depends on two types of melanin. They are injected in the cortex of the hair shaft from packets of pigments called **melanosomes.** These packets are produced from the cellular processes of the melanocytes, the melanin producing cells, which are present in the hair matrix ***(Bernard, 2006).***